Scenario-Based E-Learning Products/Tools (SBELPs) to enhance student learning & Motivation:
An Experience Sharing

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"The use of games and simulations in education is well documented in history and in the recent literature.

They have been used in preschool, K-12, the university, the military, business, and by older adults"

Dempsey, J.V., Lucassen, B.A., Haynes, L.L, & Casey, M. S.

An exploratory study of forty computer games.

(COE Technical Report No. 97-2). Mobile, AL:, 1997

The Motivation Behind the Projects

DAD Project - 2003

- SE-100 a challenging course… (*Value/Contribution, Scope → Motivation/Interest etc.*)
- As instructors we felt that there is a room for improvement in SE-100 Labs (Labs mostly included videos, visits)
- Effectively in use since last 6/7 semesters

IGS-CES Project - 2006

- Extended the experience gained in DAD project & utilize it to supplement various EE labs
- Already put to test with EE students

Literature Review

Simulation Games in Business Policy Courses, Is There A Value For Students?

Bruce A Walter, Terry NM Coalter, Abdul M A Rasheed,
Journal Of Education For Business, Washington, Jan/Feb 1997, Vol. 72, Iss. 3, pp 170

A Financial Accounting And Investment Simulation Game,

Albrecht, W. David,
Issue In Accounting Education, Sarasota, Spring 1995, Vol. 10, Iss. 1, pp 127

Industry Simulation: A New Type Of Business Game Tapping Both Analytic And Synthetic Skills,

McNeil, Margaret,
Training & Management Development Methods, Bradford, 1995 Vol. 9 Iss. 3 pp 627

Literature Review

Transformational Leadership in a Management Game Simulation,

Group & Organization Studies Mar 1988 Vol. 13, Iss. 1, pp 59

Using Simulation And Gaming To Develop Financial Skills In Undergraduates,

Sue R. Curland, S Lyn Fawcett,

International Journal Of Contemporary Hospitality Management, Bradford, 2001, Vol. 13, Iss. 3, pp 116

Literature Review

Simulation And Supply Chains: Strategies for Teaching Supply Chain Management,

David Sparling.
Supply Chain Management Bradford: 2002, Vol. 7, Iss. 5, pp 334

Multi Player Internet and Java Based Simulation Games: Learning and Research in Implementing a Computerized Version of the "Beer Distribution Supply Game",

Gilad Ravid & Sheizaf Rafaeli,
Graduate School of Business, Univ. of Haifa

Literature Review

Simulation Game for Teaching Service-Oriented Supply Chain Management: Does Information Sharing Help Managers With Service Capacity Decisions?

Edward G. Anderson Jr., Douglas J Morrice,
Production and Operations Management, Muncie, Spring 200, Vol. 9, Iss. 1 pp 40

Supply Chain Simulation – A Tool for Education, Enhancement and Endeavor,

Matthias Holweg, John Bicheno,
International Journal Of Production Economics, Amsterdam: Jul 21, 2002, Vol. 78 Iss. 2, pp 163

Literature Review

Playing Games: Evaluating the Impact of Lean Production Strategies on Project Cost and Schedule,
Alarcon, L. F. & Ashely, D. B.,
Proceedings Of the 7th Annual Conference of the International Group Of Lean Construction, IGLC-7 1999, University of California, Berkeley, CA, pp 263-273

Managing Construction Equipment Buy and Sell Decisions Replacement: a Simulation Game,
Khaled Nassar,
ASC Proceedings of The 37th Annual Conf. 2001, University Of Denver, pp 187-198.

Simulation Game for Teaching Communication Protocols,
Shifrony, E. & Ginat,
Proceedings of the 28th ACM Computer Science Education Symposium, SIGCSE, ACM Press, 1997 pp 184-188

Literature Review

The Power of Simulation-based e-Learning (SIMBEL),

Randall K.,

The e-Learning developers' Journal, 2002

A key contribution in chalking out

simulation based e-learning taxonomy

Simulation Based e-Learning SIMBEL Taxonomy

TABLE 1: ***How simulation-based e-Learning differs from other delivery vehicles***

	Asynchronous e-Learning	***Scenario***	***Simulation***	***Game-based***
What	Information	Behavior	Performance	Abstract and Intuitive Skills
How	Information display and retention assessment	Situation response	Near or pseudo reality	Artificial or heuristic reality
Learning Domain	Recall	Reasoning	Intuitive/ Emotional	Emotional/ Physical
Time Constraints	Less			More
Product Complexity	Lower			Higher

Literature Review

Due to ever-increasing scope and scale of work in this area, formulating **development standards** *are becoming important.*

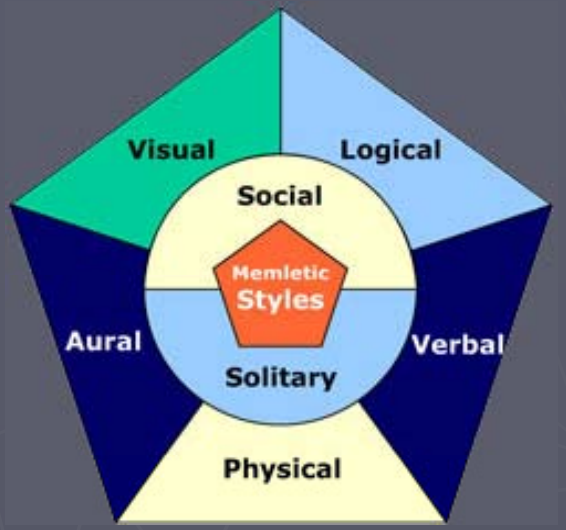
Shareable Content Object Reference Model (SCORM) is "a collection of standards and specifications for web-based e-learning. *Advanced Distributed Learning (ADL). SCORM, (2007), http://www.adlnet.gov/scorm/index.cfm*

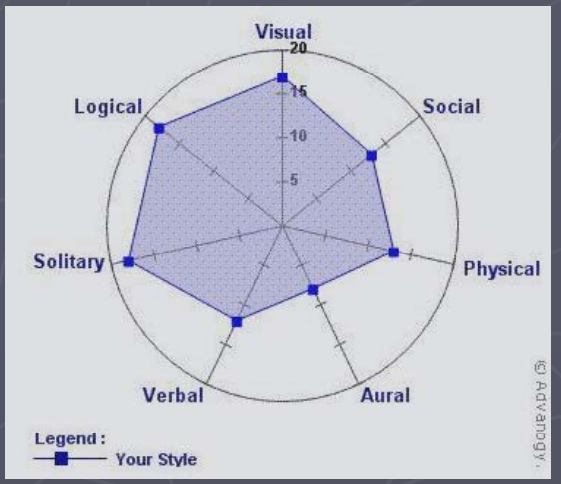
It is an e-learning standard in which the goal is to have learning objects reusable, accessible, interoperable and durable, abbreviated as 'RAID'

Li, ST and Lin, CH,
Proceedings of the 19th International Conference on Advanced Information Networking and Applications (AINA'05).

"Learning Styles"

- **Visual (spatial):** *pictures, images, and spatial understanding*
- **Aural (auditory-musical):** *sounds*
- **Verbal (linguistic):** *words, both in speech and writing*
- **Physical (kinesthetic):** *learn by doing*
- **Logical (mathematical):** *logic, reasoning and systems*
- **Social (interpersonal):** *learn in groups*
- **Solitary (intrapersonal):** *self-study*



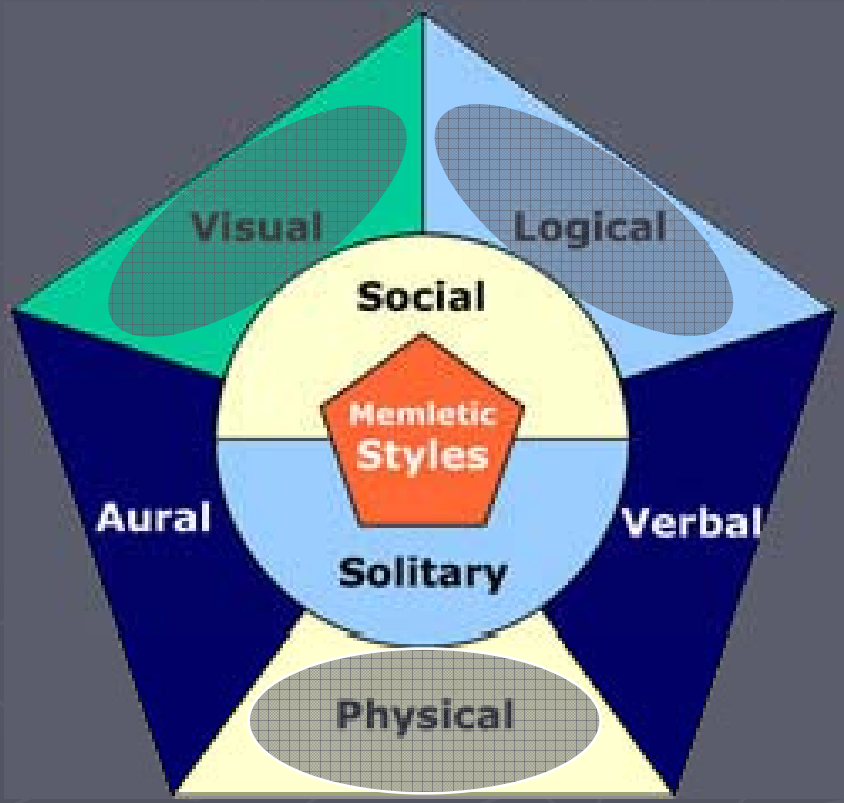


http://www.learning-styles-online.com/overview/

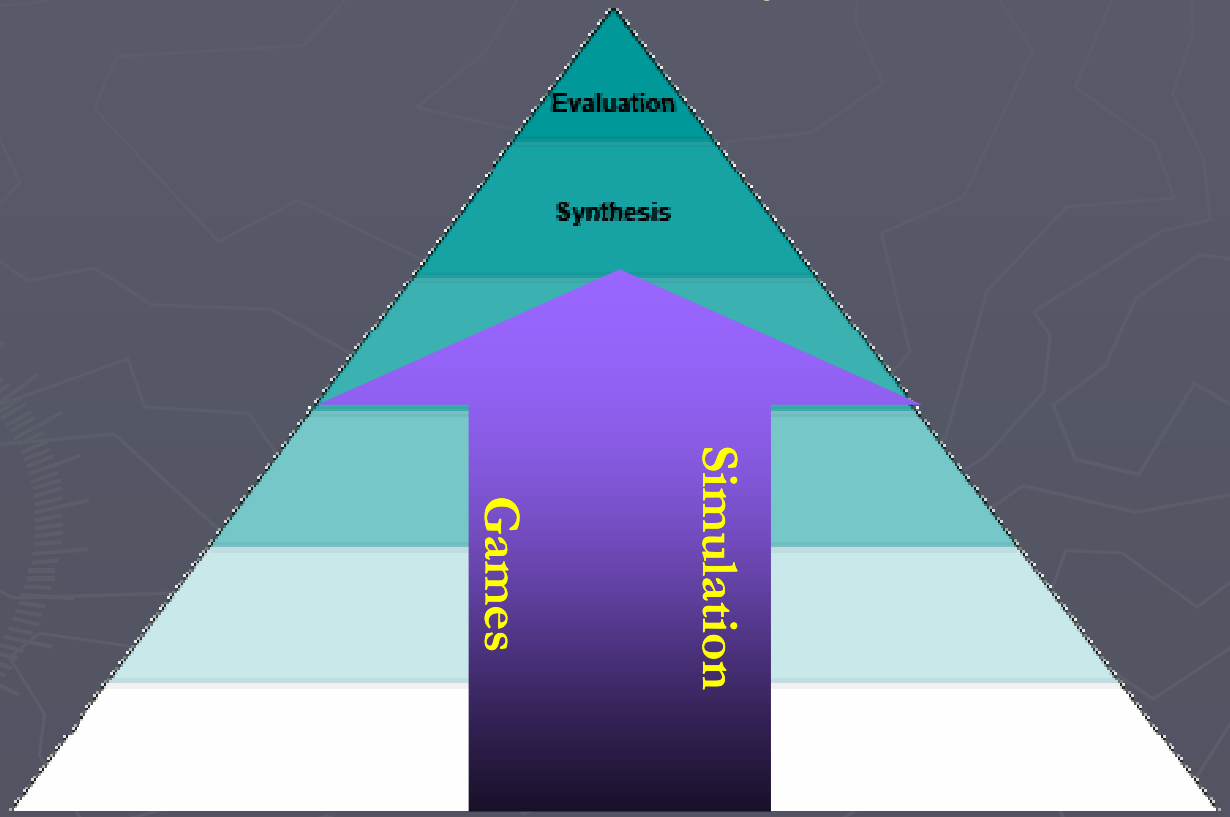
Simulation Based e-Learning Tools' Features

- Supports **Visual** style of learning
- Supports **Physical** (kinesthetic) style of learning (Active Learning)
- Supports **Logical** style of learning

Allow students to practice various **cognitive skills** such as analysis, decision making etc.



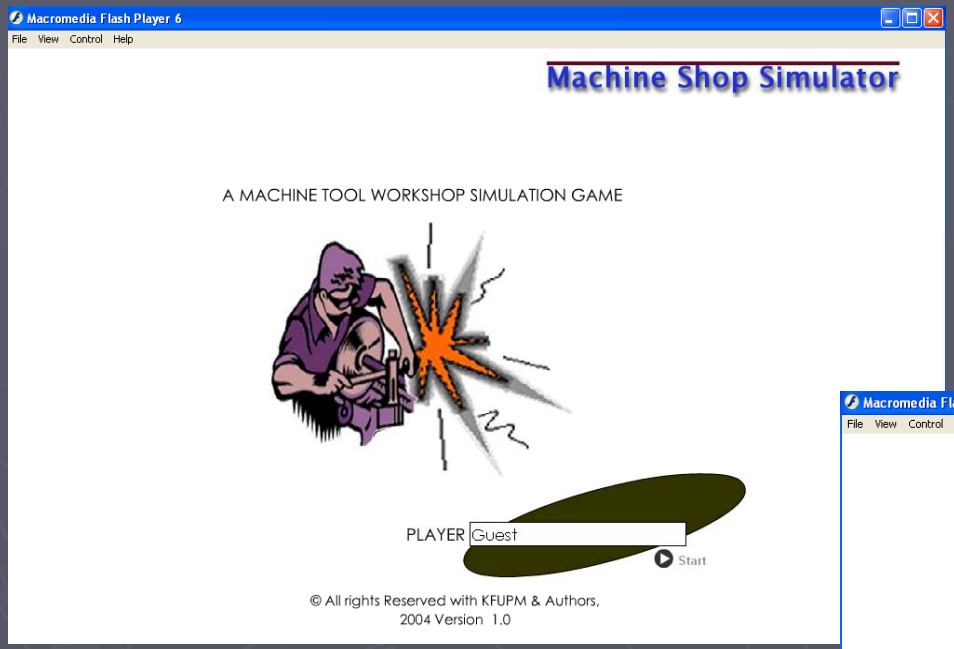
Learning by Simulation based e-learning products: Bloom's Taxonomy



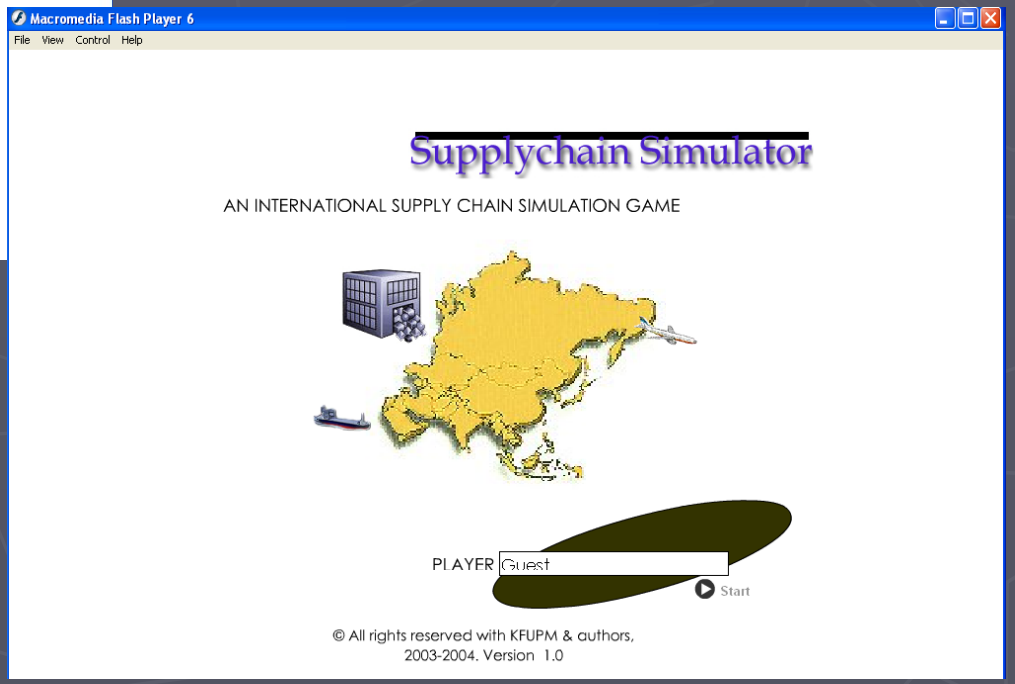
"The SBELPs in this presentation"

- Developed SBELPs Introduction
- Key Features
- Grading Policy '*attempt, target & improve*'
- Summary & Lessons

"The SBELPs"

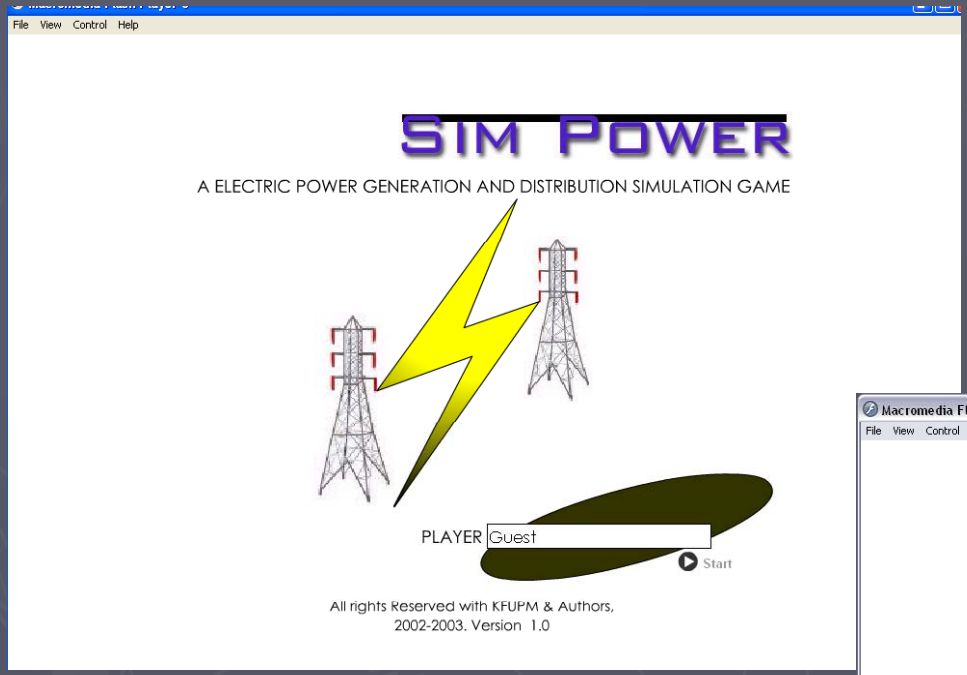


'Machine Shop simulator' simulates decision making in a manufacturing environment.

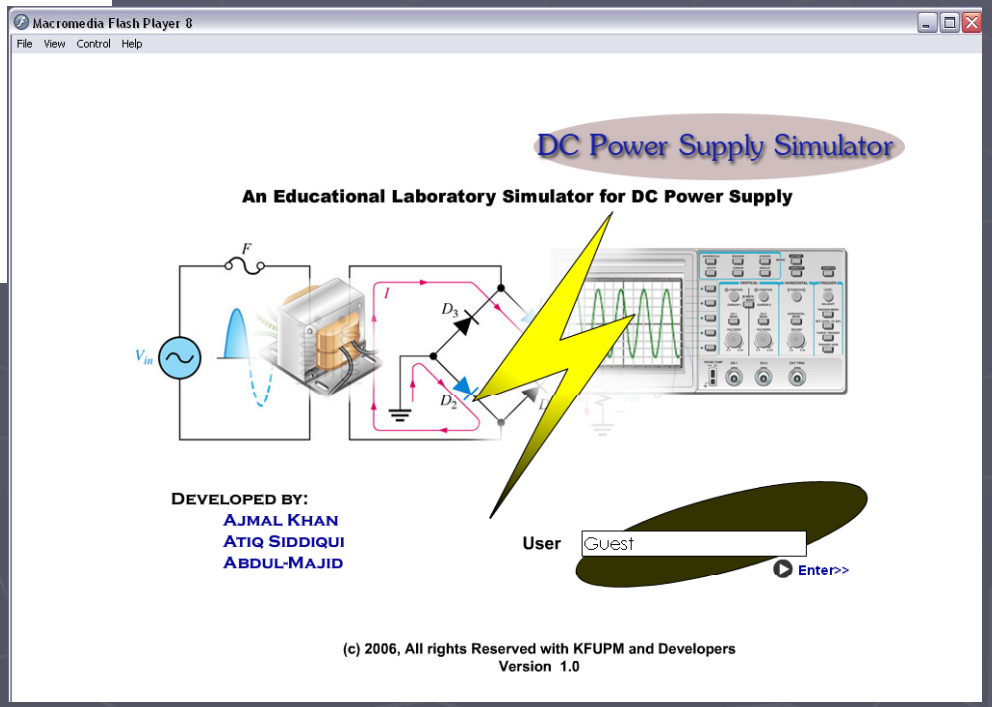


'Supply chain Simulator' tries to emulate a supply chain network.

"The SBELPs"



'Sim Power' is an electrical power generation and distribution planning simulator.



'DC Power supply simulator' simulates 3 DC supply circuits.

Key Features

All SBELPs are designed keeping a consistent style & development policies

- Interface & Development
- Navigation System
- Playing Time
- Text guides (replacing regular help texts)
- Performance Monitors (To judge performance of a student)

- A survey was conducted to get the feedback of SE-100 & EE faculty and students respectively

Key Features

Interface & Development

- Macromedia Flash MX
  - Strong graphics & animation capabilities
- Actionscript
  - Good scripting language

Comment on the use of Flash:

- Very Strong graphics & animation capabilities
- The flash file shows its toll on a computer when the graphics or programming logic exceeds a certain complexity level.
  - Not a very good platform for programs for complexity over a certain level
  - For smaller simpler programs a very fast & effective development system

Key Features

Game Playing Time

- The time of a game is kept to an average of no more than 8-12 Minutes (Length is also dependant on how long one takes to plan his moves)
- SE-100 Faculty feedback was taken to decide upon the length of the game

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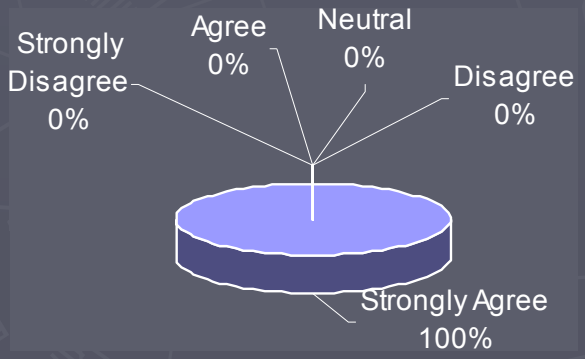
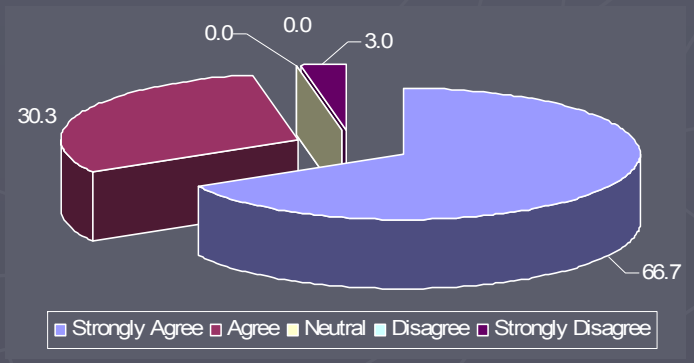
Survey Question: Game Playing time is appropriate

Faculty response



Student response



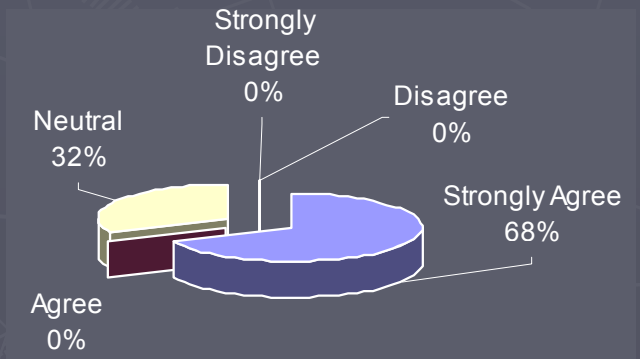
Key Features

Navigation

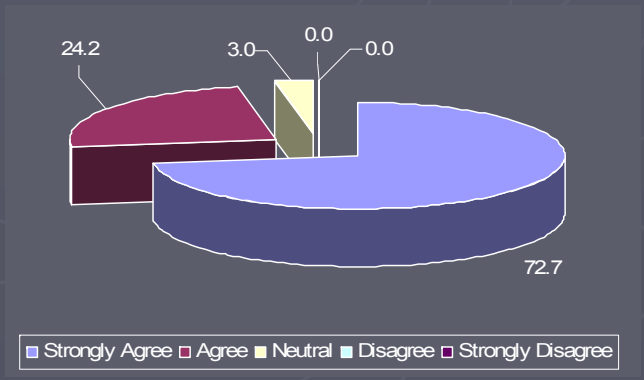
- **Easy & Intuitive Navigation System**

Survey Question: Navigation system is easy

Faculty response



Student response

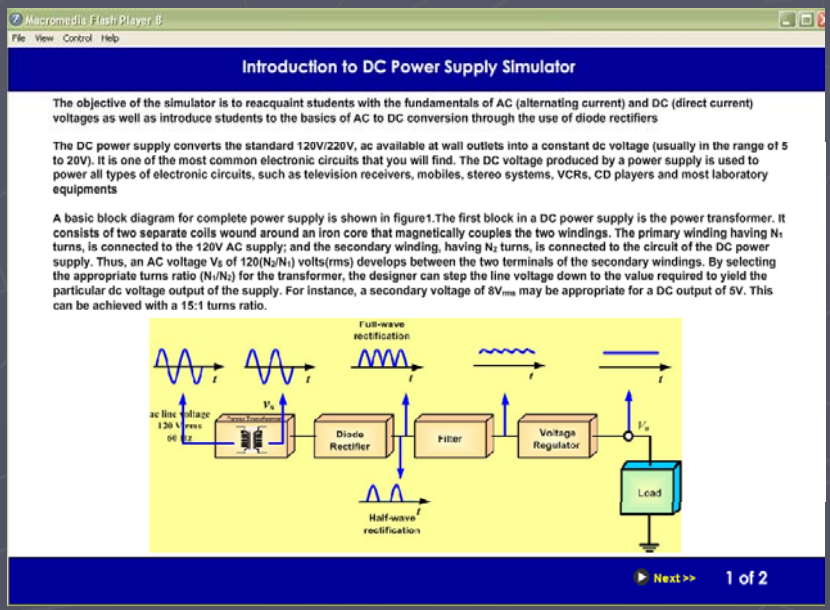


Key Features

Text Guides:

- Generally games are accompanied by help menus.
- Commonly, a player tends to start the game and experiment with the controls and concepts rather than reading the help at first.
- To avoid this problem, (in an educational games scenario), concept of text guides were introduced.
- The interface is designed in such a manner that text guide appear first.
- Game can be accessed within these text guides

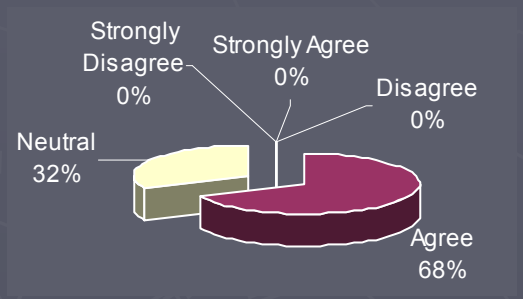
Enhancing Student Learning & Motivation through Simulation based e-Learning Products



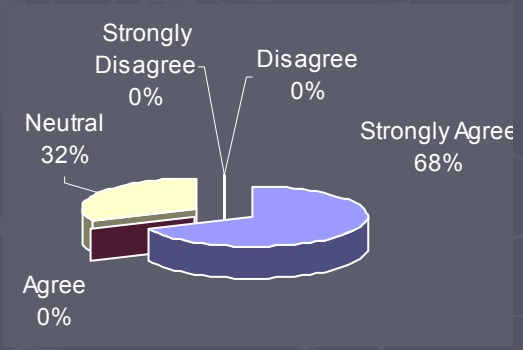
Key Features

Text Guides Survey Results

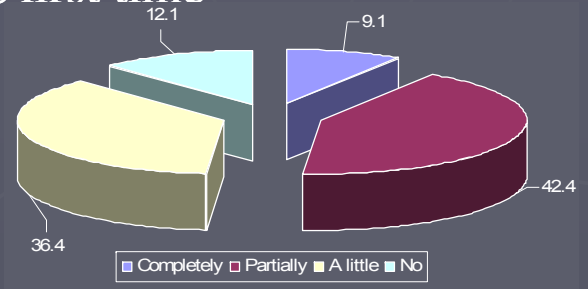
- **Faculty**
  - Concept effectiveness as compared to help menus & separate files



  - Language & Content



- **Students**
  - Read text guides before playing the games for the first time



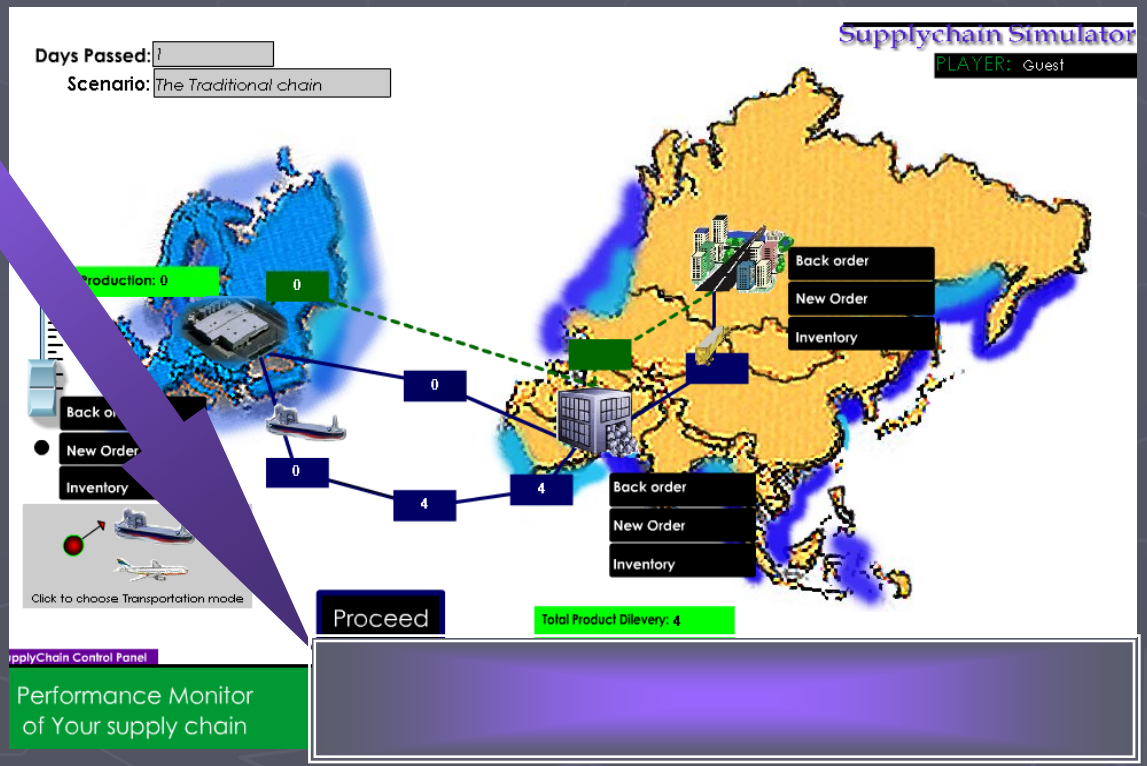
  - Language & Content
    - (Mostly say) Partially understood in first attempt. Require a number of attempt to grip
    - (Mostly) Found Material to be too long
    - ** More intuitive than regular style of help menus
    - ** (Mostly say) They would not have read it before playing the game for the first time, even partially, if it was in a separate help menu

** Individual Feedback

Key Features

Performance Monitors

- performance Monitor, an area on the playing screen, is used to judge the per mance during the play and to award final grade to a student



Grading Policy

- **Objective of the policy**
  - Motivate student to learn
  - Create a constructive and game like sense of competition
  - Encourage & allow a student to attempt the game more than once (At least 2-5 times)

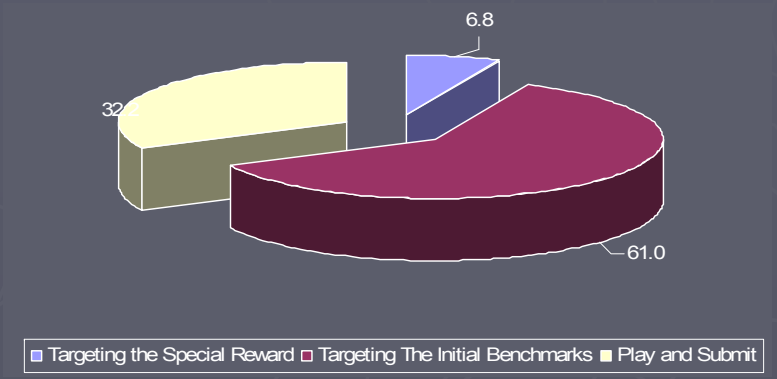
Grading Policy

- **A policy of "attempt, target & improve" was adopted. Features of this policy is as follows**
  - Various primary performance/reward targets were set for each game. This is to set and achieve initial individual targets.
  - The best performer in the class would get a special reward (Bonus). This is to create an environment of interclass competition.
  - A player can attempt as many time to achieve his target (usually given 1-2 weeks)
  - Latest best score of a game is announced regularly to give those students, who are looking for the bonus marks, the new targets.

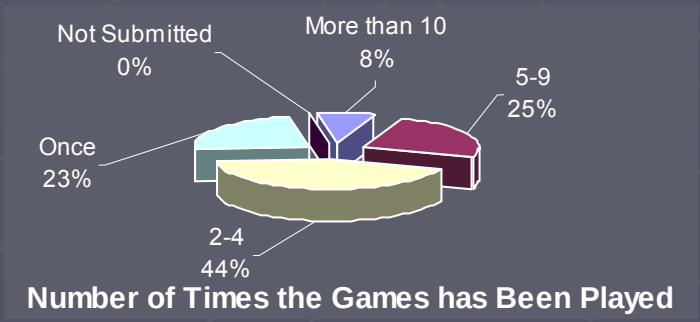
Grading Policy

Results of the Policy

- Individual student responses suggest that they feel motivated by the policy
- and they want to do better and compete with fellow students
  Survey Question: Their Target



- Survey Question: How many times have you played the game



DEMO

Summary & Lessons

- Following are some of the important observations:
  - The response, in terms of number of times the game is played, was encouraging
  - A good sense of competition was developed
  - The games proved to be a good tool to infuse student motivation and learning

Summary & Lessons

- The games were not explained (in detail) in the classrooms. Students were asked to read, understand and play the game on their own.

- About 25% – 30% of the students claimed that they understood the game well. The results or scores they achieved during the game insinuate this opinion to be true.

Summary & Lessons

- Around 5% of the students claimed that they did not understand the game at all or did not find it interesting.
- The rest of the students queried with the instructors over various clarifications in game playing, objectives and concepts & produced satisfactory results.
- Various informal questions during the assignment submission on the subject matter also suggested that the students not only gained and applied the knowledge but few were able to analyze the underlying reasons of their game performances.

Conclusion

Extensions & Suggestion

- **Multi-player**
  - Team work, Multiple roles etc. (Mainly for higher level)
- **Higher level of decision making.**
  - More decision variables etc.
- **Web based/multiplayer in case of such game applied to e-learning /distance learning environment.**